Electric Landing Gear controller and sequencer

LGC 13C

Users Guide.

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Welcome!

Congratulations on the purchase of your new landing gear controller. Xicoy are dedicated to the design and production of electronic controllers to the highest standards of quality and reliability to bring you the customer the very latest next generation designs.

Features:

-Direct control of 3 motors in bidirectional and regulated mode up to 2,5A
-Control of electric brake, full proportional, lineal and adjustable pulsed mode.
-3 servo outputs for the control of the doors, endpoints programmable
-Steering servo processor. Programmable position of servo arm in retracted mode, programmable center, sense of movement and gain on extended position.
-Single or dual channel mode.
-Programmable delay for extension and retraction of all gears independently.
-Easy programming trough a LCD display.
-Small size and lightweight.

Installation:

Thanks the small size and lightweight of the unit, it can be placed in any place on the model. We recommend a place where the wiring to the gears be the shorter as possible to have a clean installation.

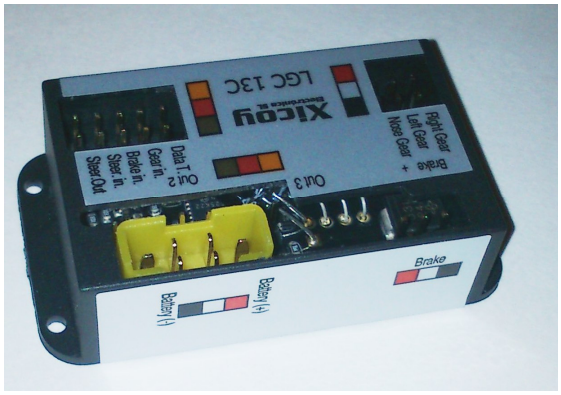
Electrical connections:

Motor connections:

Connect the 3 motor leads to the sockets in the unit. Please note that are labeled "Nose gear", "Left Gear", "Right Gear". Assure you connect the correct gear

lead to correct output in order that later during programming, the delays are applied to correct retract.
The polarity of the connection lead is marked on the label of the unit. In the case of using reversed gears, the connector should be connected backwards to reverse the operation of the motors.

Brake connections:



Connect the leads from brakes on the sockets labeled "Brake". Polarity and position are not important on the brakes.

You can use good quality JR extension leads for the motors and brake leads if necessary.

Battery connection:

Battery should be connected on the yellow MPX connector. Double check the correct polarity before connecting the battery on the unit, a reversed battery connection will destroy the unit, often the damage is beyond repair.

Output for the door servos:

Connect the 3 servos to the outputs on the unit. You can connect more than one servo to each output using a "Y" lead.

Output to the steering servo:

Connect the steering servo to "Steer Out" if used.

Radio inputs:

You can choose to use a single channel to control the gear and brake, or separated channels. Gear input channel should be always connected for operation, brake channel and steering input channel are optional.

Power supply considerations: PLEASE READ!

This controller can receive up to 3 different power sources. In order to prevent malfunctions in your system you should know that:

-The main battery should be between 6,6 to 9,9V. Recommended battery is a Lipo of 7,4V. Please double check the polarity before connecting it. The damage caused by polarity reversal is not covered by warranty!!!

This battery powers the motors and the brakes. The controller have a internal switch operated by the *Gear Input* power. It is not necessary to disconnect this battery between uses, but it is recommended to disconnect it after the flying session. There is

a minimal power drawn from this battery when the unit is switched off that can drain a battery in a 2 month period.

In the case you use battery regulators:

-The steering servo is powered by same supply as on the steering input (*Steer In*). So, for example, if the steering input comes from a battery regulator (powerBox, etc) at 6V and the *Gear In* channel comes directly from the receiver powered at 5V, the steering servo will be powered at 6V.

-The outputs to the servos for the doors are powered from the *Gear Input* socket. If you connect directly the gear input to a low power source (for example, directly to the receiver when the receiver is powered by a low power, 5V regulator) the current draw by the servos of the doors could be excessive, causing the receiver to switch off.

-The power input pin of the *Gear* and *Brake* inputs are internally connected together. This could cause a malfunction by connecting different voltages together. For example, if you connect the *Gear Input* directly to the receiver that is powered at 5V and the *brake input* to a battery regulator that supply 6V, then the 6V supply will flow trough the unit to the receiver, being no longer powered at 5V by a independent regulator. In this case, it is necessary to cut the central wire (red) on the lead from *Gear In* to the receiver to prevent the voltage present at *Brake In* to reach the receiver. The controller and the door servos will be powered by the power arriving to the *brake input*.

-All negative (ground) connections are connected together inside the unit. Always fully disconnect the batteries (both poles) from the installation before charging, as current can flow trough the unit from one battery to the other during charge, damaging the installation.

Please contact to Xicoy Electronica for advice on particular installations.

SETUP:

Once you have installed the controller in your model, you can adjust the radio, outputs, delays and steering servo.

Setup can be done trough a data terminal or trough a pushbutton and LED light. Full functions are only available if programmed trough the data terminal.

In both cases, first of all you should decide if you will use one or two channels for control, and then setup your transmitter accordingly. Check with a servo first that the transmitter is operating as it should and to identify the RX channels used.

-Double channel operation. The *Gear In* input control the retract operation and the *Brake* input control the brake.

-Single channel operation: The *Gear In* input control both the gear and the brake. The operation similar to a turbine engine control where raising the trim enable the engine to run and the stick throw regulate the engine power. In this case, first the gear will be operated and then the brake. For example, you can setup a channel that from –100% to –75% activate the gear and from –75% to +100% regulate the brake power.

The following setup procedure assumes the use of a Xicoy data terminal, please jump to the "Manual Setup" section for the pushbutton and Led setup procedure.

Setup using a data terminal:

Connect the data terminal (Same model as used by Xicoy V10 ecus) on the socket at left side of *Gear In* input.

You can navigate trough the different menus by the buttons on the left side of the box, and values are changed using the + and – buttons on the right side.

First screen displayed show the status (gear up, gear down, etc), the battery voltage, power of the brake, and, during motor operation, the amperage to each of the motors.

Second screen display the RC signals measured from the receiver. You can check that the RX connection is working and the measured values change when the transmitter controls are operated. Standard RC signal go from 1000 to 2000uS, 1000us typically is displayed on RC transmitters as –100% 1500uS 0% and 2000uS as +100%. Due at display space the numbers are divided by 10, so a measured signal of 1400uS is displayed as "140". You can check that, when operating the transmitter, the reading change accordingly.

On third screen you can scroll trough the different programming sections. Select the area you want to program by pressing the "+" button.

Radio Setup:

On this section you can program the radio inputs to mach your transmitter and setup the brake power.

First screen is the Gear Up position:

Set the transmitter switch or slider of the gear channel in the position you wish that the gear be in retracted position. Current reading is displayed on the right side of the screen. Once the TX is set, press the “+” button. The controller will store the current signal received as “gear up” command.

Next screen is the Gear Down position:

Set the transmitter switch or slider of the gear channel in the position you wish that the gear be in extended position. Once the TX set, press the “+” button. The controller will store the current signal received as “gear down” command.

Next screen is the Brake OFF position:

Set the transmitter switch or slider of the brake channel (or on the gear channel if you use the single channel option) in the position you wish that the brake be unpowered. Press the “+” button. The controller will store the current signal received as “Brake OFF” command. Note that if in this step the controller does not detect a valid signal in the brake input, then it will assume a single channel operation mode, To enable double channel, this step should be repeated once the brake channel is connected to a valid RC signal source.

Last radio screen is the Brake Maximum position.

Set the transmitter switch or slider of the brake channel (or on the gear channel if you use the single channel option) in the position you wish that the brake be at maximum power. Press the “+” button. The controller will store the current signal received as “Brake 100%” command

This completes the radio setup for the gear and brake channels. But two more adjust options are offered in this section:

Brake limiter: The limiter usually is set at 100% and the brake power is adjusted trough the TX, but in the case that you need to limit the maxim brake power, you can decrease this setting to reduce the power applied to brakes.

Brake pulse ratio: The power to the brakes could be pulsed in order to produce a “ABS like” operation, brake power is pulsed at fast rate to avoid to create “flats” on the tires on hard braking. It is possible to adjust the brake pulses in different values to change the ratio between the “high power” and “low power” pulse depending on wheel diameter and model weight.

Servo sequencer setup:

The unit provides 3 independent outputs for to control the servo operated doors. All 3 outputs are adjusted by the same procedure, so the setup of only one output is described

It is possible to define 3 different positions for each output:

Gear Up position: The position you wish that the servo be driven when the gear is retracted. Typically is a closed door.

Gear Down position: The position you wish that the servo be driven when the gear is extended. Depending on model type, could be a opened or closed door.

Motor ON position: The position of the doors when the retracts are moving, typically open.

The setup of the position in each phase is easily done by the help of the steering input channel. In the case you don't use this channel on your installation you should temporarily connect a RC signal from the rx or from a servo tester in order to operate the servos manually to the desired position.

It is recommended to connect only the servo being adjusted to avoid the other servos to move uncontrolled during the setup.

First screen is the "Servo 1 Gear Up position". When this screen is displayed, the *servo1 OUT* will deliver the same signal as arriving to the Steering input, so that you can move the servo directly trough the rudder stick on your TX. Set the servo at the position you want that it to be when the gear is retracted, and press the "+" button. The current position will be stored in the permanent memory of the controller. In the case you don't want to modify this position to keep the old stored value, simply change of screen by the menu buttons, the settings are only changed on the permanent memory when the "+" button is pressed.

Next screen is the "Servo 1 Gear Down position". Operate the servo trough the TX to the position you want that it to be when the gear is extended, and press the "+" button. The position could be the same as the "gear up" position if you want a CLOSED-OPENED-CLOSED sequence.

Last screen is the "Servo 1 Motor On position". Again, operate the servo trough the TX to the position you want that it to be when the gear is in movement, and press the "+" button to store the setting. Usually is the same position as the "gear down" position in the OPENED-CLOSED sequence, but also it allow programming an over travel, the door opens more during gear operation to give extra clearance to the wheel and legs, but return to "scale" position when the gear is fully extended.

Servo 2 and Servo 3 are programmed same way.

Last screen is the "**Servo switch off time**:" To prevent the possibility of a servo to be overloaded and burned due at being jammed, a protection function is added that allow to release the servo force after some seconds (programmable by this parameter). After the movement of retracts is finished, the servo signal is switched off, that cause the servo to act as "unpowered". The servo position is refreshed each 15 seconds to compensate the small movement of the servo (if any) during these 15s to keep the door in to commanded position, assuming that there is not a considerable force acting on the servo during the switch off period. In the case you want that the servo be active all the time, set this parameter to zero.

Correct operation of this feature implies a servo that become "soft" when no signal received. All analog servos act like this, but some digital servos hold the position when no signal is received. If you plan to use digital servos on the doors and to use the

switch off feature, check first if your servo is compatible, or use a analog servo. The Hitech and Multiplex digital servos we have tested are not suitable, but JR 8511 is.

Motor delay:

To replicate the operation of full size landing gears, it is possible to set a programmable delay for each motor operation.

First screen on this section is the delay in seconds of the main, left gear when Gear Up is selected. “Gear Up Delay Main Left” is displayed on the screen. Use the +/- buttons to set the time you want the controller wait before the left main motor is operated since the Gear Up command is selected.

Second screen is the delay time on the same gear (main left) motor operation when “gear down” is selected.

Next screens adjust same delays for right mains and nose gear. Please note that you can use this function to insert a delay from door operation to gear operation by programming same delay on all 3 motors.

Steering servo processor:

The steering servo is controlled trough the unit to assure that the nose wheel is centered to a defined position during retraction and does not move while the gear is retracted. Over this function, a signal processor is added that allow modifying the center, gain and direction of operation of the steering when the gear is down. Thus, it is possible to take the steering input signal from the same channel as the rudder, despite the different centering, sense of movement and travel between these two servos, saving one RC channel.

Setup:

Connect the Steering input to the desired RX channel for the steering (or troughs a “Y” lead on the rudder channel).

If you use same signal as the rudder, first setup the rudder centering and travel. Once you are satisfied with the rudder operation, connect the steering servo and proceed to adjustment.

First adjustment is the position of the steering servo at retracted position. Using the rudder channel of your TX, set the servo to the position you want it when the gear is being retracted and stored. Press the “+” button to store the setting in the permanent memory.

Next adjustment is the centering of the servo in deployed position. Double check that the rudder is centered, and then using the + and – buttons center the steering servo.

Finally, check the steering travel and sense. A range of adjustment from –200% to +200% is provided. Positive numbers mean same direction as rudder, negative numbers mean reverse operation. A 100% setting give same travel and direction as the rudder servo, -100% give same travel but reverse operation, 200% travel mean double travel than rudder, 50% give half movement. Once you set the travel and sense, it is

possible that the centering need a new adjust, just go back to previous adjustment by the menu buttons.

Motor adjust:

This last section of adjustment allows adapting the unit to different motors. These adjustments are not available in some of the units that are setup by motor manufacturer.

First adjustment is “Motor Cut Amperage”. Maximum value is 2,5A. This is the threshold amperage to detect that the motor have arrived at end of travel. This is the most important parameter that should be set to the recommended value from the motor manufacturer. It should not be changed unless you know exactly what you are doing. A too high value could cause that the endpoint be undetected, burning the motor, or that the gear train to be damaged by a excess of torque.

Next, it is the “Unload time”. When the gear movement is finished, a short pulse of reversed power is sent to the motor to remove the tension stress on the gears, bearings and suspension. Too low time will not unload the motor, causing high stress and wear; too long time can move the slider out of “lock” position.

Last adjustable parameter is the “Maximum Motor time”. This is a security parameter that will power down the motors after a certain operation time (programmable) to prevent the case that the endpoint is undetected.

Last screen display a counter of operations to track the number of the cycles and schedule maintenance.

Manual operation:

Besides the operation in normal mode (controlled by the radio), there unit offers several testing options to operate the gear in manual model.
Under “Manual mode” menus, you can deploy or retract the gear, with the possibility of to stop and resume the movement in any point, plus operate each gear independently up and down, with the possibility of to stop, reverse and resume the movement in any point of the travel.

NOTE: When you leave the manual mode menus, the controller will return to a “RC mode”, so the gear will move automatically to the currently command received from the transmitter.

Switch On delay:

There is some intelligence build in the controller to prevent unwanted gear operation when switching on the receiver and power supply. At power up, the controller will wait during 3 seconds, waiting for the receiver to boot and stabilize the outputs, ignoring any glitches that it could generate during this time. After these 3 seconds, the controller will begin to check the RC signal, but will wait to operate the gear until a change on RX signal is received. Thus, if at “switch on” the gear is down, but the signal received from the TX is “gear up”, the gear will keep down, it will be necessary to place the TX switch to “gear down” and back to “gear up” to initiate the retraction.

Setup without the Data terminal:

There is a LED indicator and a pushbutton to allow setup the unit without the data terminal. In this case the options are considerably reduced from the full options available using the data terminal.

Connect the RC channels you want to use (*Gear In* obligatory, *Brake In* and *Steering In* optional). Set the *Steering In* (Rudder channel) in the position you want that the steering servo be placed during retraction and gear up position.

Leave the main battery disconnected to prevent accidental movement of motors.

Switch off the power. Press the button with the aid of a plastic rod (a pen, etc, but nothing metallic that could damage the electronic board). While the button pressed, switch on the power on the receiver.

When receiver powered, release the switch.

The blue LED will light intermittently, one short flash with a long pause between flashes.
Set your transmitter at the position you want the gear to be retracted.
Once the TX set, press the switch again. Hold it pressed until it lit continuously, this will indicate that the command received from the TX as been stored as “Gear Up” command.
Release the button, the led will blink 2 short times followed by a long pause. Repeat the procedure described above for to memorize the remaining radio commands:

1 blink -> Gear Up command
2 blinks -> Gear Down (extended) command
3 blinks -> Brake OFF. The unit will detect if signal present on Brake In, if not will assume single channel mode.
4 blinks -> Brake maximum.
5 Blinks- > Steering servo retracted position.

NOTE: Executing this procedure will set all remaining adjustments to the factory defaults, all delays, door servo positions, steering servo adjustments will be reset to default. This procedure allow to use the controller in simple models without the need of a data terminal.